CLAIMS:

- A purified or isolated Herpes simplex virus recombinase comprising an alkaline nuclease and a single stranded DNA binding polypeptide, wherein the recombinase has polynucleotide strand exchange activity.
- 2. The purified or isolated Herpes simplex virus recombinase of Claim 1, comprising a Herpes simplex virus-1 recombinase.
- 3. The purified or isolated Herpes simplex virus recombinase of Claim 2, wherein the alkaline nuclease is Herpes simplex virus-1 UL12 and the single stranded DNA binding polypeptide is Herpes simplex virus-1 ICP8.
- 4. The purified or isolated Herpes simplex virus recombinase of Claim 2, wherein the ratio of the alkaline nuclease to the single stranded DNA binding polypeptide is 1:500 to 1:1.
- 5. The purified or isolated Herpes simplex virus recombinase of Claim 3, wherein the alkaline nuclease, the single stranded DNA binding polypeptides, or both are isolated polypeptides.
- 6. The purified or isolated Herpes simplex virus recombinase of Claim 3, wherein the alkaline nuclease, the single stranded DNA binding protein, or both are expressed in a host cell.
- 7. The purified or isolated Herpes simplex virus recombinase of Claim 6, wherein the host cell is an insect cell or a VERO cell.
- 8. A host cell comprising a Herpes simplex virus recombinase, wherein the Herpes simplex virus recombinase is expressed from a first polynucleotide comprising a Herpes simplex virus-1 UL12 polynucleotide operatively linked to expression control sequences, and a second polynucleotide comprising a Herpes simplex virus-1 ICP8 polynucleotide operatively linked to expression control sequences.

- 9. The host cell of Claim 8, wherein the first polynucleotide and the second polynucleotide are present on a single expression vector.
- 10. The host cell of Claim 8, wherein the host cell is an insect cell or a VERO cell.
- 11. A method of promoting homologous recombination, comprising contacting:

a purified or isolated Herpes simplex virus recombinase, wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide, and wherein the recombinase has polynucleotide strand exchange activity;

a donor polynucleotide comprising a first donor homology region at a first end, a second donor homology region at a second end, and an exogenous sequence therebetween; and

a target polynucleotide comprising a first donor homology region at a first end, a second donor homology region at a second end, and an endogenous sequence therebetween;

wherein contacting is performed under conditions sufficient to promote homologous recombination.

- 12. The method of Claim 11, wherein the first donor homology region and the first target homology region are substantially homologous; and wherein the second donor homology region and the second target homology region are substantially homologous.
 - 13. The method of Claim 11, wherein contacting is in vitro.
- 14. The method of Claim 13, wherein the alkaline nuclease comprises purified Herpes simplex virus-1 UL12 and the single stranded DNA binding polypeptide comprises purified herpes simplex virus-1 ICP8.
 - 15. The method of Claim 11, wherein contacting is in a host cell.
 - 16. The method of Claim 15, wherein the host cell is a mammalian cell.

17. The method of Claim 15, wherein the host cell comprises a first polynucleotide comprising a Herpes simplex virus-1 UL12 polynucleotide operatively linked to expression control sequences, and a second polynucleotide comprising a Herpes simplex virus-1 ICP8 polynucleotide operatively linked to expression control sequences.

18. A cloning kit, comprising:

a Herpes simplex virus recombinase, wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide, and wherein the recombinase has polynucleotide strand exchange activity; and

a target polynucleotide comprising a first homology region at a first end, a second homology region at a second end, and an endogenous sequence therebetween.

- 19. The cloning kit of Claim 18, wherein the Herpes simplex virus recombinase comprises a Herpes simplex virus-1 recombinase.
- 20. The cloning kit of Claim 19, wherein the alkaline nuclease is Herpes simplex virus-1 UL12 and the single stranded DNA binding polypeptide is Herpes simplex virus-1 ICP8.
 - 21. The cloning kit of Claim 18, further comprising a host cell.
- 22. The cloning kit of Claim 21, wherein the host cell comprises a first polynucleotide comprising a Herpes simplex virus-1 UL12 polynucleotide operatively linked to expression control sequences, and a second polynucleotide comprising a Herpes simplex virus-1 ICP8 polynucleotide operatively linked to expression control sequences.
- 23. The cloning kit of Claim 18, wherein the endogenous sequence comprises a polylinker.
- 24. The cloning kit of Claim 18 wherein the endogenous sequence comprises at least one regulatory sequence for protein expression.

- 25. A method of treating a eukaryotic host cell, comprising delivering to the eukaryotic host cell:
- a Herpes simplex virus recombinase, wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide, and wherein the recombinase has polynucleotide strand exchange activity; and

a donor polynucleotide comprising a first donor homology region at a first end, a second donor homology region at a second end, and an exogenous sequence therebetween.

- 26. The method of Claim 25, wherein the Herpes simplex virus recombinase comprises a Herpes simplex virus-1 recombinase.
- 27. The method of Claim 26, wherein the alkaline nuclease is Herpes simplex virus-1 UL12 and the single stranded DNA binding polypeptide is Herpes simplex virus-1 ICP8.
 - 28. A method of obtaining a transgenic non-human animal, comprising:

delivering to an embryonic stem cell or zygote a Herpes simplex virus recombinase, wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide; and a donor polynucleotide comprising a first homology region at a first end, a second homology region at a second end, and an exogenous sequence therebetween; wherein the exogenous sequence integrates into a genome of the embryonic stem cell or the zygote; and

producing from the embryonic stem cell or the zygote a transgenic non-human animal.

- 29. The method of Claim 28, wherein the Herpes simplex virus recombinase comprises a Herpes simplex virus-1 recombinase.
- 30. The method of Claim 29, wherein the alkaline nuclease is Herpes simplex virus-1 UL12 and the single stranded DNA binding polypeptide is Herpes simplex virus-1 ICP8.

31. The method of Claim 28, wherein the transgenic animal comprises a gene knock-out.

32. A method of treating an organism comprising:

delivering to the organism a composition comprising a Herpes simplex virus recombinase; and a donor polynucleotide comprising a first homology region at a first end, a second homology region at a second end, and an exogenous sequence therebetween; wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide, and wherein the recombinase has polynucleotide strand exchange activity.

- 33. The gene therapy method of Claim 32, wherein the Herpes simplex virus recombinase comprises a Herpes simplex virus-1 recombinase.
- 34. The method of Claim 32, wherein the Herpes simplex virus recombinase is expressed in an infectious vector.

35. A method of making a modified host cell comprising:

delivering to the host cell a composition comprising a Herpes simplex virus recombinase; and a donor polynucleotide comprising a first homology region at a first end, a second homology region at a second end, and an exogenous sequence therebetween; wherein the Herpes simplex virus recombinase comprises an alkaline nuclease and a single stranded DNA binding polypeptide, and wherein the recombinase has polynucleotide strand exchange activity.

36. The method of Claim 35, wherein the Herpes simplex virus recombinase comprises a Herpes simplex virus-1 recombinase.